STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

June 28, 2004

Air and Radiation Docket
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Room B108; Mail Code 6102T
Washington, DC 20460

Attention: Docket ID No. OAR-2002-0056

Dear Sir or Madam:

The Michigan Department of Environmental Quality (MDEQ), on behalf of the State of Michigan, submits the attached comments in response to the U.S. Environmental Protection Agency's (EPA's) *Federal Register* notices of January 30, 2004, regarding the "Proposed National Emission Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generation Units; Proposed Rule," and the March 16, 2004, Supplemental Notice. These two proposals are known as the Utility Mercury Reductions Proposals.

The MDEQ supports meaningful improvements in the EPA's administration of the federal Clean Air Act (CAA), including measures that (1) are protective of human health and the environment; (2) are comprehensive and responsive to a specific air quality concern; and (3) include effective measures to ensure real, timely progress in attaining federal and state air quality goals and objectives.

The MDEQ supports the EPA's efforts to reduce mercury emissions from coal-fired electric generating units. However, this proposal falls short of the reductions needed to protect human health and the environment, and one of the proposals does not meet the requirements of the CAA. Regional reductions of mercury are needed to protect the human population and Michigan's waterways and water bodies from mercury pollution.

The MDEQ appreciates the opportunity to comment on the proposed mercury Maximum Achievable Control Technology. Please contact Mr. G. Vinson Hellwig, Chief, Air Quality Division, at 517-373-7069 if you have any questions on these comments, or you may contact me.

Sincerely,

Steven E. Chester
Director
517-373-7917

Attachment
cc/att: Governor Jennifer M. Granholm
Mr. Jim Sygo, Deputy Director, MDEQ
Mr. G. Vinson Hellwig, MDEQ

State of Michigan
Comments on the
Utility Mercury Reductions Proposals
June 28, 2004

U.S. Environmental Protection Agency
69 *Federal Register* 4652, January 30, 2004
69 *Federal Register* 12398, March 16, 2004
Docket No. OAR-2002-0056

Introduction

As a background for Michigan's comments, listed below are some facts to keep in mind:

- Michigan has many water bodies with fish consumption advisories due to measured mercury levels, plus a statewide advisory since 1988 for all of Michigan's lakes and reservoirs.
- Michigan has 169 water bodies identified with mercury levels above the federal water quality standard.
- 73 percent of the electricity generated in Michigan is from coal combustion.
- 56.7 percent of the mercury air emissions in Michigan are from coal-fired utilities.
- Michigan is a net importer of electricity and subject to mercury emissions from neighboring states that also have coal-fired utilities.
- Michigan is surrounded by the Great Lakes and part of the Great Lakes Region. This region constitutes the largest surface area of fresh water on earth and contains 25 percent of the world's fresh surface water supply.
- The Great Lakes Region constitutes 90 percent of the United States' fresh water supply.
- The Great Lakes Region contains 80,000 interior lakes that are at the greatest risk for mercury deposition, and combined have a surface area greater than Lake Erie.

As you can see, Michigan has unique concerns with the impact of mercury emissions and deposition to our state and the Great Lakes. Michigan's comments will only focus on mercury emissions from coal-fired electric generating units (EGUs).

Recension of "Appropriate and Necessary" Finding

The EPA's proposal rescinds the December 20, 2000, finding under Section 112(n)(1)(A) of the federal Clean Air Act (CAA) that it was "appropriate and necessary" to regulate EGUs under Section 112 of the CAA based on EPA's current reading of that finding. As stated in EPA's proposal preamble:

> *The study reveals that there are no confirmed hazards to public health associated with emissions of such HAP[s]. We do not believe that it is appropriate to regulate coal- and oil-fired electric utility steam generation units based on HAP emissions with no confirmed health effects.* [Emphasis added.]

This conclusion appears to have been drawn without plain reading of that finding and without consideration of the evidence presented in the finding (scientific evidence that is readily available) or reading the conclusion of that finding. The EPA's proposal states that the conclusion reached in December 2000 could not have been reached based on the information on record prior to 2000. This ignores scientific evidence available and referenced in the finding.

Michigan strongly disagrees with the withdrawal of the December 20, 2000, finding that indicated the need to regulate mercury (and nickel) through the Section 112 process. Mercury is a potent neurotoxin, and the developing fetus is most at risk from methylmercury poisoning. Environmental persistence and bioaccumulation in the aquatic food chain, followed by human exposure via fish consumption, is the dominant exposure pathway. Ingestion of methylmercury in fish leads to absorption into the bloodstream and transfer to developing fetuses. Michigan has many water bodies with fish consumption advisories due to measured mercury levels, plus a statewide advisory since 1988 for all of Michigan's inland lakes and reservoirs. In January 2003, the Centers for Disease Control and Prevention (CDCP) estimated that nearly 8 percent of women of childbearing age are exposed to mercury levels that are above those considered safe for a developing fetus. More recently, EPA researchers have indicated that, based on examinations of umbilical cord blood, the estimate is closer to 15 percent. Regardless of which of these estimates is more correct, mercury toxicity to neurological development is a critical public health problem.

In the preamble, the EPA states:

> Given the current scientific understanding of the environmental fate and transport of this element, it is not possible to quantify how much of the methylmercury in fish consumed by the U.S. population is contributed by U. S. emissions relative to other sources of Hg (such as natural sources and re-emissions from the global pool). As a result, the relationship between Hg emission reductions from Utility Units and methylmercury concentrations in fish cannot be calculated in a quantitative manner with confidence.

The MDEQ supports efforts to reduce mercury emissions, even if the accurate quantitation of environmental improvement may not be possible. However, we are dismayed that the EPA has not provided estimates of the magnitudes and timelines of environmental improvements under the proposed regulatory approaches. We would like EPA to develop and describe (with appropriate qualifiers) estimates of the potential environmental benefits (i.e., reductions in fish mercury levels) of the proposals. The EPA (Cocca, 2001, "A Quantitative Spatial Link Between Air Deposition and Fish Tissue") provides a recommended approach for relating the reductions in mercury deposition to associated reductions in fish mercury levels. This approach is intended by EPA for Total Maximum Daily Loads development and to help evaluate the benefits of technology-based air emission reduction standards. We believe that EPA may be able to couple that approach with a mercury emissions inventory and available monitoring data, and provide a useful characterization of the potential environmental benefits of the proposals on state, regional, and national scales. If that is not considered to be feasible, then EPA should provide a more thorough description of the limitations of the methodology and the remaining data gaps which need to be addressed.

Cost-Benefit Considerations

The EPA seems to have chosen to base the regulatory decision-making in the proposal on cost and benefit considerations, but as the proposal states, only qualitative consideration is possible for the health benefits of reduced emissions of mercury. The EPA's position is that health benefits cannot be assumed or estimated quantitatively, and that a specific change in total mercury emissions cannot be related to any specific change in methylmercury concentrations in

fish or health improvements, nor over what time period any changes would occur. This conclusion is used as the justification to not perform a quantitative cost-benefit analysis. This lack of quantitative analysis is an obvious avoidance of appropriately determining or estimating the health benefits or lack of health benefits of EPA's proposal.

The EPA's proposal also does not discuss that more recent CDCP studies suggest that 8 percent of women of childbearing age are exposed to mercury levels that are above those considered safe for a developing fetus. More recently, EPA researchers have reported an estimate of 15 percent based on umbilical cord blood tests. The EPA's proposal does not quantitatively factor that into its cost-benefit analysis, whether the number is 8 percent or 15 percent.

Deposition

On April 2, 2004, the U.S. Geological Survey (USGS) presented a briefing in Indiana on their preliminary data (Risch, USGS, April 2, 2004) indicating that monitored mercury wet deposition is directly related to the quantity of mercury air emissions within 50 kilometers. A copy of this briefing is attached to these comments. This is direct evidence suggesting that localized deposition of mercury does occur, which supports our concern for potential localized impacts.

Proposed National Emission Standards for Hazardous Air Pollutants (NESHAP) - MACT [112(d)]

One of the proposals that EPA has requested comment on is regulation of mercury through Section 112(d) of the CAA. In Section 112(n)(1)(A), Congress instructed EPA to regulate Hazardous Air Pollutants (HAPs) from EGUs if it is "appropriate and necessary." Our view is that there is no question of the "appropriateness" or the "necessity" of regulating mercury emissions from EGUs. It is incumbent upon EPA to regulate mercury emissions from EGUs through Section 112(d).

Maximum Achievable Control Technology (MACT) Floor

Michigan agrees that the subcategorization by coal rank is appropriate for this MACT category. However, we disagree with the method used to determine the MACT subcategory floors. The statistical method used took into account the variability of mercury in the coals and the variability of the chlorine content in the coals leading to an exaggerated variance that is applied to the coal analysis values in the Information Collection Request. While we do recognize that chlorine content plays a role in the mercury emissions, this statistical model yields a far higher mercury emission limit than is appropriate for all the subcategories. The application of this variance analysis in this manner also does not address the effect of secondary pollution control techniques and yields a higher emission limit than it would otherwise. Michigan recommends that EPA perform their own floor analysis and not rely on the statistical model (WEST Associates report) devised and funded by the utility industry.

In the case of the integrated gasification combined cycle electric utility steam generating unit (IGCC) floor number, it is unclear why this model was applied to this technology. Both chlorine and mercury would be removed separately from the coal as part of the fuel preparation process. Therefore, chlorine and mercury could not interact as they are not present at the same quantitative levels as in the combustion process of coal-fired boiler units. This is a misapplication of the statistical technique in applying variability from a different combustion

process to calculate the MACT floor for the IGCC subcategory. This leads to an artificially high mercury emission limit for new IGCC sources.

The EPA did not adequately evaluate "beyond-the-floor" alternatives. The review of sorbent injection studies does admittedly leave the 90 percent or greater removal of mercury in question for all coal-fired units at this time. However, sorbent injection combined with fabric filtration has been shown to greatly reduce mercury emissions. There are also several studies available that show mercury reduction as a secondary benefit (or co-benefit) from other pollutant reduction technologies. The evaluation of beyond-the-floor technologies was not adequately addressed in this proposal and should be reconsidered before rejecting them.

The discussion in the preamble of the differences between solid and medical waste incinerator mercury reduction and coal-fired mercury emission reduction had a misleading premise. It states that because of waste separation techniques, greater reductions in mercury are achieved. This is a false premise because the mercury reductions achieved are from inlet and outlet testing after the removal of mercury from the waste stream. Therefore, waste stream separation **does not** typically become part of the mercury reduction calculation. The proposal indicates that "spikes" will result in a high mercury removal efficiency based on mercury input to the control system. The reference in the proposal to mercury "spikes" would mean that these "spikes" would always occur in one or more of the three two-hour runs in the source test at all facilities tested everywhere and every time, and this is highly unlikely. Also, municipal waste is frequently more homogeneous than even some coal fuels due to the shredding and mixing. Also, there is a lower concentration of mercury in the gas stream of waste incinerators, making mercury more difficult to remove. Mercury reductions of 85-90 percent are achieved even after good waste separation techniques.

Michigan agrees with a U. S. Department of Energy comment that as technology advances, the importance of coal ranks may diminish in Phase 2. To that end, there should be a placeholder in the rule to allow for a review of the limits at some time period before Phase 2, e.g., three years, to review the limits by coal rank and revise those limits (to be more stringent) if appropriate due to improving mercury reduction technology.

The EPA should revisit the MACT floor levels that were discussed by the EPA-MACT stakeholders' workgroup. The EPA unilaterally abandoned this process in October 2003 and the work done by that group needs to be considered in setting the MACT floors.

Proposed NESHAP - Cap-and-Trade Program [112(n)(1)(A)]

Michigan opposes a national cap-and-trade program for mercury. Michigan does support the concept of market-based mechanisms to provide flexibility and cost-effective pollution reductions with provisions for states to place limits on mercury trading, and for the assessment of local impacts and evaluation of total mercury emissions. This proposal does not afford any protection for mercury "hotspots." Comment was requested in this proposal on this issue, but without further verified monitoring data, states have only the contaminated water bodies to demonstrate that the deposition of elemental and ionic mercury is taking place. The assumption that "hotspots" are not an issue to be considered in a national cap-and-trade program would lack the human and ecological protection that is needed in this rule. If there is a mercury trading program, it should be limited to an in-state only program or limited to a region-specific (e.g.,

Great Lakes) program. Assuming a trading program is implemented, there are specific issues that need to be addressed. Specific comments on the cap-and-trade program are presented in *Phase II Supplemental Notice of Proposed Rulemaking, Cap-and-Trade Rule* of this document on page 6.

Proposed New Source Performance Standards (NSPS), Sections [111(b) and (d)]

There is no reference in the CAA to the shift of regulation of a HAP from Section 112 to Section 111. The statements made in this proposal are without foundation. The EPA uses as justification in this proposal the different language in the House and Senate versions of Section 112 of the CAA Amendments of 1990 (CAAA). Plain reading of the language in the Senate and House versions of the CAAA would lead to the reasonable conclusion that the regulation of a HAP is required through Section 112 if it is determined that such a regulation is "appropriate and necessary." The EPA made a weak argument at best for regulation through Section 111, given the report to Congress on HAP emissions from EGUs and the scientific evidence of human and environmental harm from mercury emissions. EGUs should be regulated through Section 112.

It is difficult to conceive that Congress meant EPA to consider regulations not yet conceived or proposed (such as Section 111(d)) when reporting to Congress on the study of HAPs from EGUs. The EPA cited Representative Oxley's statement "taking into account compliance with all provisions of the Act and other federal, state or local regulation...." as justification for regulation through Section 111. It is interesting to note this statement did not make reference to future effective regulation, nor did it use the future tense at all. It is difficult to understand how EPA can interpret this statement as meaning undrafted future effective regulations when that is not what the statement says. The EPA is using this language to propose regulations to reduce mercury under Section 111 and refers to the Interstate Air Quality Rule, which is also an unpromulgated rule. Congress also stated that the consideration of the regulation of mercury from EGUs should be done "after imposition of the requirements of this Act." This statement precedes the requirement for a report to Congress based on findings including the previous statement.

The EPA is proposing NSPS limits of mercury for new facilities, and proposing to use Section 111(d) to regulate existing facilities. Section 111(d) would require the states to come up with a State Implementation Plan (SIP)-like plan to regulate existing facilities and leaves out a requirement for national consistency in mercury emission limits. This would lead to a patchwork of regulations with varying emission limits for existing sources. A state can regulate emissions from facilities in their own state, but this provision would not provide protection from deposition of emissions from an upwind state. Given the language in the proposal, there are no assurances that EPA would consider deposition from an upwind state to a downwind state when reviewing the "SIP like" control requirements. This means that the Section 111(d) approach would not protect public health in Michigan from upwind states with mercury-emitting EGUs. The Section 111 proposal also includes a cap-and-trade approach to limiting mercury from existing plants with emission budgets for each state. Not only do we disagree with the regulation through Section111(d), a national cap-and-trade program would not protect public health or the environment in our state. Reduction of mercury in a downwind state as opposed to reduction in an upwind state would not decrease deposition of mercury in the downwind state.

Michigan presented more detailed comments on the cap-and-trade program under Section 112 in the section titled Proposed NESHAP - Cap-and-Trade Program [112(n)(1)(A)] on page 4.

Michigan strongly disagrees with the concept of regulating mercury through Section 111 of the CAA.

Executive Order 13045 "Protection of Children from Environmental Health and Safety Risks"

The EPA failed to adequately address this Executive Order (EO). The EPA stated, "The strategies proposed in this rulemaking will further improve air quality and will further improve children's health." Neither of the proposals, Section 112 or Section 111, specifically addressed this issue other than in this very general statement. Fetuses and children are the most sensitive group to mercury pollution and ingestion. The EPA should provide a better explanation on how Section 112 or Section 111 will protect children's health and provide a comparison to further mercury reduction requirements relative to the reduction levels proposed.

Phase II Supplemental Notice of Proposed Rulemaking, Cap-and-Trade Rule

As stated previously, Michigan does not agree with a national cap-and-trade program. If a cap-and-trade program is instituted, it should be limited to a state or region of the country. The following are comments on the rule language:

Heat Input vs. Energy Output
The EPA's proposal allows the sum of the unit emission allowances in a state to become the state's emissions budget, with the basis being a hypothetical proportionate share of the baseline heat input to total heat input of all affected units. Michigan believes an energy output model is the preferred method to determine the region-wide and state-specific budgets and allowances. This model would, in effect, reward the companies that are utilizing renewable energy sources and conservation techniques and would encourage new technology for energy generation. Because using the "energy out" model encourages cleaner technology development, it encourages alternatives to coal and oil combustion other than the current move to natural gas as the solution to cleaner energy.

Budget
The proposed budget for mercury emissions is set too high and does not provide for adequate reductions in Phase I. It is dismaying to see that public information releases on the reduction in Phase 2 are exaggerated and will not occur by 2018 as the releases state. Further, the budget allocation for Michigan would not reach the national average of reduction even in the 2018 projection—only 63 percent. The budgets were established by fuel types burned in the EGUs, but the focus must be on needed mercury reductions and these budget numbers are presently proposed much too high. The method for budget allocations must be modified if a cap-and-trade program is initiated in order to ensure protection of the public health.

Michigan believes in the necessity of requiring the use of serial numbers or some mechanism for tracking and reporting of mercury emissions. The program must remain virtually transparent to all entities; serial numbers encourage transparency in addition to the benefits derived for tax and accounting purposes.

Michigan believes in the necessity for two primary types of accounts as stated in the proposal: compliance accounts and general accounts. Compliance accounts are created for each "Hg Budget" source with one or more "Hg Budget" units upon receipt of the account certificate of representation form. General accounts are created for any organization or individual upon receipt of a general account information form.

Michigan agrees with a comment made by the U.S. Office of Management and Budget that it is "a bit ridiculous to allow retired units to receive allocations in perpetuity." Future allocations should be set at less than the shut down facility if that facility is replaced. The replacement facility would meet a new source limit and therefore emit less mercury emissions than the shut down facility it replaced. If the permitting and construction of a new facility is not commenced in a specified reasonable time, there should be a decrease over time in the allocation for the shut down going to zero, e.g., five years. The overall state budget should also be decreased as described above.

Michigan supports provisions for states to place limits on mercury trading and supports the proposed "flexibility to choose" what allowance allocation methodology states will use to determine their mercury budgets. Michigan supports the availability of different possible options and combinations in the development of an allocations methodology. These are:

1. Auction or free distribution of allowances;
2. Permanent or updated allowances; and
3. Allowances based on input-basis, output-basis, or based on emission reductions.

One consideration should be that for an interstate trade, the mercury reduction requirement should stipulate that it can only be accomplished if the Section 111(d) limits are as stringent or more stringent in the selling state as they are for the facility in the purchasing state. This would be more complicated with different subcategories, but a matrix to represent appropriate exchanges could be developed.

Title V Reconciliation

A Title V permit incorporates applicable requirements that are created separately under other authorities, but does not directly establish specific standards unless explicitly provided by the CAA (such as adding periodic monitoring). In the case of the Hg Budget program requirements, the proposed rule appears to require permitting authorities to directly create mercury permit requirements in Title V permits. What authority under the CAA allows the Hg Budget rule to change Title V program requirements and to allow Title V to directly create mercury program permitting requirements?

In addition, the proposed Hg Budget rule includes specific permit provisions, including permit applications, permit revisions, permit content, compliance certifications, etc. However, there are many instances where the proposed Hg Budget rule permit requirements are inconsistent with the Title V permit program provisions. For example:

1. The general permit requirement in proposed Section 60.4120 specifies that the "Hg Budget portion" of the Title V permit shall be administered in accordance with the permitting authority's Title V operating permits regulations. However, the proposed rule

does not comport with the existing Title V permit content requirements, particularly with respect to monitoring requirements. Any reader of a Title V permit should be able to directly determine what are a source's emission limits or operational restrictions and exactly what monitoring, recordkeeping and reporting will be used to demonstrate compliance with those applicable requirements. The "Hg Budget permit portion" does not include that same level of detail.

2. The proposed language in Section 60.4121 specifically requires that an Hg Budget permit application be submitted 18 months before January 1, 2010 (or the date on which the Hg Budget unit commences operation for new units). However, Section 70.6(f) does not require that the source submit an application to revise a Title V permit for new promulgated requirements; rather, it requires that the permitting authority initiate a Title V permit reopening for cause if there are three or more years remaining before the current Title V permit expires.

3. Section 60.4121(c) states that the Hg Budget authorized account representative shall submit a complete Hg Budget permit application "in accordance with the permitting authority's Title V operating permits regulations addressing operating permit renewal." Most of Michigan's Title V permits for the listed Hg Budget subject sources will not be due for renewal during the specified Hg Budget time frame. In what way does the Hg Budget permit renewal synchronize with the Title V renewal schedule? The proposed wording is far too vague to adequately address the nuances of the renewal process.

4. All submittals pursuant to the Title V permit program must be certified by a "responsible official," with specific compliance certification requirements for annual and semiannual reports. The wording of Section 60.4130, on the other hand, requires data report and compliance certification submittals by the "authorized account representative" for different information and based on schedules that do not mesh with the Title V time frame.

Please clarify how the permitting agencies should resolve these differences.

Banking

Michigan does not support EPA's proposal that banking of allowances after the start of the Hg trading program be allowed with no restriction. Michigan would support a decrease in availability of banked allowances in one of two ways. The first option could be a time-generated reduction. For example, the allowances would "expire" after a definite time period. The other method could be to require the use of older banked allowances on an increasing ratio based on age, i.e., 1 to 1.5 or 1 to 2.

Safety Valve Provision

Michigan does not support the provision for a safety valve dollar amount for the mercury allocations. Allowing sources to purchase allowances under a safety valve price guarantee may discourage companies from seeking more cost-effective means to control mercury. This could inhibit the advancement of new technology for control of mercury, because it allows sources to control only to a set dollar amount regardless of the advances in control technology.

Also, Michigan believes that neither the EPA nor states have authority under Section112(n)(1)(A) to collect payment from the purchaser for a safety valve allowance.

Summary

The EPA must regulate and require reductions of mercury emissions from EGUs to protect human health and the environment. In summary, Michigan supports the regulation of mercury emissions from EGUs under the traditional Section 112(d) approach for HAP emissions, but believes the logic used to determine the MACT subcategorical floors needs to be reassessed. Michigan opposes a national cap-and-trade program under Section 112(n)(1)(A). Michigan also does not believe that regulation through Section 111 is legally viable, nor that a national cap-and-trade program under Section 111 is appropriate. If a cap-and-trade program is instituted, it should be contained to a geographic area, and the budgets need to be lowered in order to protect certain areas. The phased approach under Section 112(d) for mercury control and reduction is reasonable; however, the Phase 2 date for mercury reductions should be reviewed and an earlier date considered.

Attachment

Atmospheric Deposition of Mercury in Indiana and nearby Emissions Sources

Briefing for Indiana Department of Environmental Management Mercury Work Group
by Martin Risch, U.S. Geological Survey
April 2, 2004

Summary

Statewide monitoring of mercury in precipitation in Indiana indicates that mercury deposition may be influenced by mercury emissions near the monitoring station. The ranking of monitoring stations by mercury deposition per inch of precipitation and the volume-weighted mercury concentration in samples is the same as the ranking of monitoring stations by annual mercury emissions from sources within 50 kilometers of each station. The correspondence of rankings for monitoring stations in Indiana by mercury deposition, mercury concentration, and nearby mercury emissions has limitations and uncertainties that could change this interpretation.

Mercury Concentrations and Mercury Deposition in Precipitation

More than 600 weekly precipitation samples were collected by the U.S. Geological Survey (USGS) at five monitoring stations in Indiana, January 2001 through December 2003. Mercury concentrations in these samples and the associated weekly precipitation volumes were used to compute the weekly wet deposition of mercury at the monitoring stations. The stations were ranked by the total of the weekly mercury wet deposition at each station during the 3 years of monitoring divided by the total precipitation during the 3 years (table 1). The stations also were ranked by the mean mercury concentrations in the samples from the monitoring stations, weighted to the total sample volume during the 3 years (table 1). These calculations allow direct comparison among sites by normalizing the data to remove differences caused by variability in precipitation amounts and sample volume collected at each station.

Mercury-Emissions Sources near Monitoring Stations

The Indiana Department of Environmental Management (IDEM) compiled an inventory of mercury-emissions sources and annual mercury-emission amounts in Indiana for the Regional Air Pollutant Inventory Development System (RAPIDS), using data for 2001. The inventory included reported or estimated mercury emissions for point sources and non-point sources. Estimates for coal-burning electric-power-generation plants were based on mercury-emissions factors developed by the U.S. Environmental Protection Agency (USEPA). IDEM considers this inventory to be the most accurate information currently available and that it is unlikely to have changed substantially through 2003. The USEPA Emissions and Generation Resource Integrated Database (E-GRID) 2000 data were used to include annual emissions from four electric-power-generation plants (two in Illinois by the monitoring station near the Indiana/Illinois state line and two in Kentucky by the monitoring station near the Indiana/Kentucky state line). Data for other point sources within the radius in Illinois and Kentucky were not included.

Geographic coordinates were used to plot the mercury-emission point sources inside a 50-kilometer radius around each of the five mercury-monitoring stations. The 50-kilometer radius was selected in consultation with IDEM. This distance is used in the USEPA Industrial Source Complex Model, a steady-state plume model that does not allow meteorology to vary within 50 kilometers of the emission source. The total annual mercury emissions for point sources inside the 50-kilometer radius were used to rank the monitoring stations (table 2).

Atmospheric Deposition of Mercury in Indiana and nearby Emissions Sources

The correspondence in ranks among mercury deposition, mercury concentrations in precipitation, and annual mercury emissions indicate that atmospheric deposition of mercury at these monitoring stations may be influenced by nearby emission sources. The analysis has several limitations and uncertainties however that could change this interpretation. Three years of mercury-monitoring data were used to develop the rankings. Except for 2003, rankings based on annual data differ from the 3-year average ranking. Also, only three-quarters of a year of data were available for the Fort Harrison monitoring station for this analysis. Additional years of mercury-monitoring data and updated mercury-emissions data can determine whether the current rankings will remain the same.

The influence of wind direction and precipitation patterns on mercury deposition from nearby emission sources was not examined for this analysis. Analysis of wind and weather data could improve an evaluation of the influence of nearby mercury-emission sources on mercury deposition. A basis for selecting a radius larger or smaller than 50 kilometers was not determined for this briefing. The rankings of monitoring stations based on annual mercury emissions within a 30-kilometer radius are different than the rankings for the 50-kilometer radius, but rankings were the same within a 60-kilometer radius.

Finally, the analysis relies only on samples of wet deposition and therefore does not account for the total deposition of mercury that is occurring at the monitoring stations. Beginning in 2004, the USGS will be collecting samples of dry deposition for analysis of mercury at four of the monitoring stations. These data will provide a more complete understanding of mercury deposition in Indiana and will allow a more rigorous analysis of the influence of nearby emissions on local deposition.

Table 1. Summary of normalized mercury deposition, volume-weighted average mercury concentration, and median mercury concentration at five monitoring stations in Indiana, January 2001-December 2003

[$(ng/m^2)/in.$, mercury deposition in nanograms per square meter per inch of precipitation; ng/L, nanograms per liter]

Statewide rank	Monitoring station	Normalized mercury deposition	Volume-weighted mean mercury concentration
1	Dunes Lakeshore	334 $(ng/m^2)/in.$	13.1 ng/L
2	Clifty Falls	315 $(ng/m^2)/in.$	12.4 ng/L
3	Fort Harrison[a]	296 $(ng/m^2)/in.$	11.8 ng/L
4	Roush Lake	292 $(ng/m^2)/in.$	11.6 ng/L
5	Bloomington	256 $(ng/m^2)/in.$	10.3 ng/L

[a]Data for April 2003 through December 2003.

Table 2. Summary of annual mercury emissions from point sources within 50 kilometers of five monitoring stations in Indiana

[Data from Indiana 2001 RAPIDS and USEPA 2000 E-GRID for Illinois and Kentucky]

Statewide rank	Monitoring station	Annual mercury emissions	Number of sources
1	Dunes Lakeshore	1,878 pounds	32
2	Clifty Falls	1,628 pounds	8
3	Fort Harrison	493 pounds	24
4	Roush Lake	252 pounds	12
5	Bloomington	141 pounds	7